AMENDMENTS TO THE CLAIMS

1. (Currently Amended) A device for monitoring the acceleration of a body part having an outer surface, comprising:

a plurality of sensing devices constructed and arranged orthogonal to the outer surface of the body part and not orthogonal to each other to respectively detect acceleration in a corresponding plurality of directions which are each orthogonal to the outer surface of the body part; the plurality of sensing devices being constructed and arranged to generate a signal in response to a sensed acceleration in each of the corresponding plurality of directions;

a processing device connected to the plurality of sensing devices and being constructed and arranged to receive signals from the plurality of sensing devices and determine the magnitude and direction of an impact to the body part in the plurality of directions which are each orthogonal to the outer surface of the outer surface of the body part.

2. (Original) The device of claim 1, wherein said plurality of sensing devices are single-axis linear accelerometers.

3. (Original) The device of claim 1, wherein said plurality of sensing devices are multi-axis linear accelerometers with at least one axis thereof being orthogonal to the outer surface of the body part.

4. (Currently Amended) The device of claim 1, further comprising:

a protective layer of material positioned about the body part; and

a plurality of portions of cushioning material disposed between the body part and the protective layer of material.

5. (Currently Amended) The device of claim 4, further comprising:

a carrier web being closely fitted around the body part; the plurality of sensing devices being attached to the carrier web and positioned orthogonal and proximal to the outer surface of the body part <u>and not orthogonal to each other</u> to respectively sense acceleration in directions which are each orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u>.

6. (Currently Amended) The device of claim 5, further comprising:

a plurality of carrier clips positioned between the plurality of portions of cushioning material; the carrier clips respectively carrying the plurality of sensing devices and being positioned orthogonal and proximal to the outer surface of the body part <u>and not orthogonal to each other</u> to respectively sense acceleration in directions which are each orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u>.

7. (Currently Amended) The device of claim 5, wherein the plurality of sensing devices are embedded within the plurality of portions of cushioning material and are positioned orthogonal and proximal to the outer surface of the body part <u>and not orthogonal to each other</u> to respectively sense acceleration in directions which are each orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u>.

8. (Currently Amended) The device of claim 1, wherein the plurality of sensing devices are three devices positioned approximately 120 degrees apart from one another about the circumference of the body part to respectively sense acceleration in three directions <u>residing the same plane</u> which are each orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u>.

9. (Previously presented) The device of claim 1, further comprising:

a recording station connected to the plurality of sensing devices.

10. (Original) The device of claim 9, wherein the recording station is connected to the plurality of sensing devices by wire.

11. (Original) The device of claim 9, wherein the recording station is connected to the plurality of sensing devices by radio transmission.

12. (Original) The device of claim 1, wherein the body part is a head.

13. (Original) The device of claim 1, wherein said plurality of sensing devices are mounted in a helmet.

14. (Original) The device of claim 1, wherein said plurality of sensing devices are mounted in a head band.

15. (Currently Amended) A method for determining the magnitude and direction of impact to a body part having a geometric shape, comprising the steps of:

positioning a plurality of accelerometers proximate to the outer surface of a body part;

orienting the plurality of accelerometers to sense respective linear acceleration in respective directions which are each orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u>;

positioning the plurality of accelerometers in a defined arrangement about the surface of the body part;

recording acceleration data sensed by the plurality of accelerometers in the directions which are each orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u>;

providing a hit profile function from the geometric shape of the body part and the positioning of the plurality of accelerometers thereabout to respectively sense acceleration in directions which are each orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u>;

generating a plurality of potential hit results from the hit profile function;

comparing the plurality of potential hit results to the acceleration data sensed by the plurality of accelerometers;

best fit matching one of the potential hit results to the acceleration data to determine a best fit hit result; and

determining the magnitude of linear acceleration, in each of the directions which are orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u>, and the direction of an impact to the body part from the best fit hit result.

16. (Original) The method of claim 15, wherein the surface of the body part is defined by the circumference of the body part, along which the plurality of accelerometers is approximately a circle.

17. (Original) The method of claim 16, wherein the hit profile function is equal to a * cos (s-b)+c where a is the impact magnitude, s is the arc defining the accelerometer position, b is the impact direction and c is the radial acceleration due to pure rotation about the superior-inferior Z-axis and known data ranges are employed to generate potential hit results.

18. (Original) The method of claim 15, wherein the configuration of the body part is a geometric shape.

19. (Original) The method of claim 18, wherein the configuration of the profile generating function corresponds to the geometric shape.

20. (Original) The method of claim 15, wherein matching one of the potential hit profiles to the acceleration data employs least-squares regression model to determine the best fit profile.

21. (Currently Amended) The method of claim 15, further comprising:

estimating the rotational acceleration of the body part from the magnitude of linear acceleration in each of the directions which are orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u> and the location of the impact to the body part from the best fit hit result by multiplying the distance from the location of the impact

to an axis of rotation of the body part by the magnitude of the linear acceleration of the body part.

22. (Currently Amended) A method of acceleration monitoring, comprising the steps of:

attaching an acceleration-monitoring technology device, having acceleration sensors, to an individual such that the acceleration sensors remain fixed relative to a body part of the individual during physical activity where the body part has an outer surface;

measuring accelerations of the body part of the individual during physical activity along at least a first, a second and a third acceleration measurement direction, wherein the first acceleration measurement direction is orthogonal to the outer surface of the body part, and the second acceleration measurement direction is orthogonal to the outer surface of the body part, and the third acceleration measurement direction is orthogonal to the outer surface of the body part; <u>the first acceleration measurement direction, the second acceleration measurement direction and the third acceleration measurement direction not being orthogonal to each other;</u>

storing the accelerations of the body part of the individual in each of the first, second and third acceleration measurement directions which are each orthogonal to the outer surface of the body part <u>and not orthogonal to each other</u>, during the physical activity as acceleration data in a mass storage device;

retrieving the acceleration data of the body part of the individual during physical activity;

determining a direction and magnitude of the impact to the body part of the individual during the physical activity and the rotational acceleration of the body part of the individual during the physical activity from the acceleration data.

23. (New) A device for monitoring the acceleration of a body part having an outer surface, comprising:

a plurality of sensing devices constructed and arranged non-orthogonally to each other to respectively detect acceleration in a corresponding plurality of directions; the plurality of sensing devices being constructed and arranged to generate a signal in response to a sensed acceleration in each of the corresponding plurality of directions;

a processing device connected to the plurality of sensing devices and being constructed and arranged to receive signals from the plurality of sensing devices and determine the magnitude and direction of an impact to the body part in the plurality of directions which are not orthogonal to each other.

24. (New) The device of claim 23, wherein said plurality of sensing devices are single-axis linear accelerometers.

25. (New) The device of claim 23, wherein said plurality of sensing devices are multi-axis linear accelerometers with plurality of axes that are not orthogonal to each other.

26. (New) The device of claim 23, further comprising:

a protective layer of material positioned about the body part; and

a plurality of portions of cushioning material disposed between the body part and the protective layer of material.

27. (New) The device of claim 26, further comprising:

a carrier web being closely fitted around the body part; the plurality of sensing devices being attached to the carrier web and not orthogonal to each other to respectively sense acceleration in directions which are not orthogonal to each other.

28. (New) The device of claim 27, further comprising:

a plurality of carrier clips positioned between the plurality of portions of cushioning material; the carrier clips respectively carrying the plurality of sensing devices and not

being positioned orthogonal to each other to respectively sense acceleration in directions which are not orthogonal to each other.

29. (New) The device of claim 27, wherein the plurality of sensing devices are embedded within the plurality of portions of cushioning material and are not orthogonal to each other to respectively sense acceleration in directions which are not orthogonal to each other.

30. (New) The device of claim 23, wherein the plurality of sensing devices are three devices positioned approximately 120 degrees apart from one another about the circumference of the body part to respectively sense acceleration in three directions residing the same plane which are not orthogonal to each other.

31. (New) The device of claim 23, further comprising:

a recording station connected to the plurality of sensing devices.

32. (New) The device of claim 31, wherein the recording station is connected to the plurality of sensing devices by wire.

33. (New) The device of claim 31, wherein the recording station is connected to the plurality of sensing devices by radio transmission.

34. (New) The device of claim 23, wherein the body part is a head.

35. (New) The device of claim 23, wherein said plurality of sensing devices are mounted in a helmet.

36. (New) The device of claim 23, wherein said plurality of sensing devices are mounted in a head band.

37. (New) A method for determining the magnitude and direction of impact to a body part having a geometric shape, comprising the steps of:

positioning a plurality of accelerometers proximate to the outer surface of a body part;

orienting the plurality of accelerometers to sense respective linear acceleration in respective directions which are not orthogonal to each other;

positioning the plurality of accelerometers in a defined arrangement about the surface of the body part;

recording acceleration data sensed by the plurality of accelerometers in the directions which are not orthogonal to each other;

providing a hit profile function from the geometric shape of the body part and the positioning of the plurality of accelerometers thereabout to respectively sense acceleration in directions which are not orthogonal to each other;

generating a plurality of potential hit results from the hit profile function;

comparing the plurality of potential hit results to the acceleration data sensed by the plurality of accelerometers;

best fit matching one of the potential hit results to the acceleration data to determine a best fit hit result; and

determining the magnitude of linear acceleration, in each of the directions which are not orthogonal to each other, and the direction of an impact to the body part from the best fit hit result.

38. (New) The method of claim 37, wherein the surface of the body part is defined by the circumference of the body part, along which the plurality of accelerometers is approximately a circle.

39. (New) The method of claim 38, wherein the hit profile function is equal to a * cos (s-b)+c where a is the impact magnitude, s is the arc defining the accelerometer position, b is the impact direction and c is the radial acceleration due to pure rotation about the superior-inferior Z-axis and known data ranges are employed to generate potential hit results.

40. (New) The method of claim 37, wherein the configuration of the body part is a geometric shape.

41. (New) The method of claim 40, wherein the configuration of the profile generating function corresponds to the geometric shape.

42. (New) The method of claim 37, wherein matching one of the potential hit profiles to the acceleration data employs least-squares regression model to determine the best fit profile.

43. (New) The method of claim 37, further comprising:

estimating the rotational acceleration of the body part from the magnitude of linear acceleration in each of the directions which are not orthogonal to each other and the location of the impact to the body part from the best fit hit result by multiplying the distance from the location of the impact to an axis of rotation of the body part by the magnitude of the linear acceleration of the body part.

44. (New) A method of acceleration monitoring, comprising the steps of:

attaching an acceleration-monitoring technology device, having acceleration sensors, to an individual such that the acceleration sensors remain fixed relative to a body part of the individual during physical activity where the body part has an outer surface;

measuring accelerations of the body part of the individual during physical activity along at least a first, a second and a third acceleration measurement direction, wherein the first acceleration measurement direction, the second acceleration measurement direction and the third acceleration measurement direction are not orthogonal to each other;

storing the accelerations of the body part of the individual in each of the first, second and third acceleration measurement directions which are not orthogonal to each other, during the physical activity as acceleration data in a mass storage device;

retrieving the acceleration data of the body part of the individual during physical activity;

determining a direction and magnitude of the impact to the body part of the individual during the physical activity and the rotational acceleration of the body part of the individual during the physical activity from the acceleration data.